

We claim:

- 1 1. An optical return-to-zero transmitter comprising:
 - 2 means for providing a pulsed optical signal;
 - 3 an optical modulator arranged to receive a non-return-to-zero electrical data
 - 4 signal and a bias signal, to modulate said optical signal with said data signal;
 - 5 whereby said optical signal providing means and said modulator provide a
 - 6 return-to-zero optical output signal modulated with said data signal;
 - 7 means for controlling the difference in phase between said pulsed optical
 - 8 signal and said data signal in response to a phase control signal;
 - 9 means for adding a first dither signal to said difference in phase and a second
 - 10 dither signal, having a different frequency than said first dither signal, to said bias
 - 11 signal;
 - 12 means for monitoring the amplitude of variations in the power of the optical
 - 13 output signal corresponding to cross-modulation of said first and second dither signal
 - 14 frequencies; and
 - 15 means responsive to said monitored amplitude for adjusting said phase control
 - 16 signal to maintain phase synchronization between said pulsed optical signal and said
 - 17 data signal.
- 1 2. The optical return-to-zero transmitter of claim 1, wherein said means for
 - 2 providing a pulsed optical signal comprises:
 - 3 means for providing a continuous optical signal;
 - 4 a second optical modulator arranged to receive a clock signal to modulate said
 - 5 optical signal with pulses.
- 1 3. The transmitter of claim 2, wherein said second optical modulator is
 - 2 connected downstream of said optical modulator arranged to receive said non-return-
 - 3 to-zero electrical data signal.
- 1 4. The transmitter of claim 2, wherein said optical modulators are Mach-
 - 2 Zehnder modulators.

1 5. The transmitter of claim 1, wherein the frequency of said second dither
2 signal is substantially lower than the frequency of said first dither signal, and said
3 means for monitoring the amplitude comprises first means for monitoring a first
4 amplitude, being the amplitude of variations in the power of the optical output signal
5 at the frequency of the first dither signal and second means for monitoring the
6 amplitude of variations of said first amplitude at the frequency of the second dither
7 signal.

1 6. In a return-to-zero optical transmitter in which an optical signal is
2 modulated by a non-return-to-zero electrical data signal applied to an electro-optical
3 modulator and pulsation at the data rate of said data signal is provided by a clock
4 signal, to provide a return-to-zero optical output signal, a method of controlling the
5 difference in phase between said clock signal and said data signal, said method
6 comprising:
7 adding a first dither signal to said difference in phase and a second dither
8 signal, having a different frequency than said first dither signal, to a bias signal
9 applied to said electro-optical modulator;
10 monitoring the amplitude of variations in the power of the optical output
11 signal corresponding to cross-modulation of said first and second dither signal
12 frequencies; and
13 controlling said difference in phase in response to said amplitude.

1 7. The method of claim 6, wherein said optical modulator is a Mach-Zehnder
2 modulator.

1 8. The method of claim 6, wherein the frequency of said second dither signal
2 is substantially lower than the frequency of said first dither signal, and monitoring the
3 amplitude comprises monitoring a first amplitude, being the amplitude of variations in
4 the power of the optical output signal at the frequency of the first dither signal and
5 monitoring the amplitude of variations of said first amplitude at the frequency of the
6 second dither signal.